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An Acoustic Parametric Effect MEMS Amplifier/Transducer for Sonar Applications

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13. ABSTRACT (Maximum 200 words)

We have developed the first MEMS parametric amplifier for Sonar applications. The device used is a MEMS time-varying capacitor which is composed of an array of low-stress metallized silicon-nitride diaphragms, and is pumped by a large signal voltage at 1.64 MHz. This induces a large change in the capacitance, and results in parametric amplification of an input signal at 200 kHz. To our knowledge, this device is the first-ever MEMS mechanical up-converter parametric-effect amplifier developed with an up-conversion ratio of 9:1. The measurements agree very well with theory, including the effect the series resistance and the Q ofthe MEMS time-varying capacitor. The application areas are in amplifiers which operate at very high temperatures (200-600C), under high particle bombardment (nuclear applications), in non semiconductor-based amplification, and in low-noise systems since parametric amplifiers do not suffer from thermal, shot or {\em 1/f} noise problems.

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REPORT DOCUMENTATION PAGE (SF298)
(Continuation Sheet)

Accomplishments:

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Publications:

J.P. Raskin, A.R. Brown, B.T. Yakub and G.M. Rebeiz, "A novel parametric-effect MEMS amplifier," *IEEE Trans. Micro. Electro. Mechanical Systems,* Vol. 9, pp. 528-537, Dec. 2000.

J.P. Raskin, A.R. Brown, B.T. Khuri-Yakub and G.M. Rebeiz, "Novel parametric-effect MEMS amplifiers/transducers," *Transducers 2000*, Hilton Head, June 2000.

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